BOOK REVIEWS

MOSQUITO CONTROL RESEARCH ANNUAL REPORT 1989. University of California, Division of Agriculture and Natural Resources. Lowell H. Lewis and Bruce F. Eldridge. Jim Coats, Editor. Mosquito Research Program, Department of Entomology, University of California, Davis, CA 95616. 80 pp.

This book summarizes results of studies sponsored by the University-wide Mosquito Research Program. In a brief introduction Bruce Eldridge reports that "we've gone about as far as we can go" in controlling an epidemic of a vector-borne disease with the available tools, and he believes there is a critical need for research to develop alternatives to conventional chemicals for emergency use. In 1989, in California, there were 27 reported human cases of St. Louis encephalitis, and locally transmitted cases of malaria were also reported.

There are 38 reports in this publication grouped in the following categories: Mosquitoes and Public Health, Biological Control of Mosquitoes, Biology and Ecology of Mosquitoes, Chemical Control of Mosquitoes, and Student Mini-Grants. Mosquito Abatement Districts and 78 principal investigators and contributors are listed. The following account does not give a complete picture of the contents of the book; only represented samples of information are presented.

In San Diego County, malaria is known to be transmitted by *Anopheles hermsi. Culex stigmatosoma* is involved in the transmission of the St. Louis encephalitis virus. Eleven investigators have gathered significant basic information about bunyaviruses.

Much emphasis has been placed on biological control. Progress has been made in cloning genes of *Bacillus thuringiensis* var. *morrisoni* so that a strain will be more toxic to mosquitoes. Additionally, genetic engineering experiments were conducted with *Bacillus sphaericus* and *B. subtilis* to obtain more information about the 110-kDa protein, which is toxic to certain mosquito larvae. Consumption of mosquito larvae by 4 fish species in wastewater was compared. When wild rice is cultivated it is still "wild," and in wild rice fields *Culex tarsalis* and *Anopheles freeborni* population densities are much greater than in white rice fields. The occurrence of several natural enemies in both types of fields was closely monitored. Presence of sunfish affected results of these studies. Reports are presented of research on *Lagenidium giganteum, Lambornella clarki*, the tadpole shrimp and mermithid nematodes.

It is probable that the eggs of the Asian tiger mosquito cannot survive hot, dry California summers. In wildfowl marshes of Solano County, a water depth of 60 cm provides the highest density of invertebrates important in waterfowl diet and the lowest density of mosquitoes.

Among chemicals evaluated in 1989 were a synthetic pyrethroid called lamdacyhalothrin (ICI, Inc.) and pelletinized formulations of methoprene and Hexafluron.

Other studies concerned the substance in tree hole water that encourages oviposition by *Aedes sierrensis*, the effect on mosquito vectors of blood from dogs treated with ivermectin, mitochondrial genomes in *Romanomermis culicivorax*, and interactions of this nematode with mosquito hemocytes.

Researchers and administrators in California are continuing to maintain high standards in carrying out worthwhile investigations. Parenthetically it may be noted that many of the summarized reports have been published in the *Journal of the American Mosquito Control Association.*

W. E. Bickley

PICTORIAL KEY TO THE SPECIES OF INDIAN ANOPHELINE MOSQUITOES. B. P. Das, R. Rajagopal and J. Akiyama. 1989. Zoology (Journal of Pure and Applied Zoology) / Zoologie (Zeitschrift für Wissenschaftliche und Angewandte Zoologie), New Delhi. Vol. 2, No. 3, pp. 131–162.

This publication contains keys to the adults of 54 species of anophelines known to occur in India. It is well-illustrated, and numbers and letters in brackets in the couplets refer to the particular structure in the illustrations that will help the user. The couplets and their illustrations are on facing pages, which also is a definite asset. The other useful practice in this work is that the scientific names below the illustrations refer to the species, or species groups to which they apply.

This reviewer is not impressed with the inclusion of characters of more than one stage in a key. It is frustrating when one is identifying an adult female and encounters a couplet with only male characters. In this work, 5 couplets, all

within the part of the key dealing with subgenus *Anopheles*, have characters for either larva or male only, or larva/male or larva/female combinations. The major part of the key, couplets 23–54, related to the species in subgenus *Cellia*, exclusively use female characters, except for couplet 45, in which the siblings of *An. subpictus* are separated on egg characters.

The authors chose not to use the revised morphology of Harbach and Knight (1980). They are quite familiar with it and list in Table 3 some old and new terminologies. They argue that the principal users are familiar with the old terminology and changing to the new form would be unnecessarily difficult for them. This reviewer does not agree with that decision. Now is the time to modernize and standardize the published works on mosquito taxonomy. Especially troublesome is using the old nomenclature for the wing venation when most of the workers have changed to the Comstock-Needham system.

All in all it is a well-prepared publication. This reviewer is familiar with the identification of anophelines of that region and the key is a valuable addition to the arsenal of mosquito taxonomy. One error to be noted is on Table 3. The innermost seta of the prothorax should be 1-P, not 14-P.

Richard F. Darsie, Jr.
P. O. Box 699
McClellanville, SC
29458